RedFame

Studies in Media and Communication
Vol. 14, No. 4; December 2026
ISSN: 2325-8071 E-ISSN: 2325-808X
Published by Redfame Publishing
URL: http://smc.redfame.com

Digital Divide and Institutional Communication: Telecommunications Infrastructure Barriers to Transparency and Citizen Participation in Rural Areas of Ecuador

Eugenia Maricela Torres Jiménez[1], César Fernando Iñiguez Pineda[2], Ulda Maritza Moreno Loaiza[2]

[1]Universidad Politécnica Estatal del Carchi, Tulcán, Ecuador

[2]Universidad Nacional de Loja, Loja, Ecuador

Correspondence: Eugenia Maricela Torres Jiménez, Universidad Politécnica Estatal del carchi, Tulcán, Ecuador, Atisana y Avenida Universitaria.

Received: May 15, 2026 Accepted: October 23, 2026 Online Published: November 2, 2026

doi:10.11114/smc.v14i4.8836 URL: https://doi.org/10.11114/smc.v14i4.8836

Abstract

Government transparency and digital citizen participation in Latin America are conditioned by the available telecommunications infrastructure, particularly in rural areas of the region. This narrative review, with a systematic search, analyzes the telecommunications infrastructure barriers to providing broadband Internet access, which limit institutional communication aimed at transparency and citizen participation in rural areas of Ecuador, with a Latin American scope. A search was conducted in Scopus, Web of Science (WoS), SciELO, Redalyc, and Google Scholar (2020–2025) following the PRISMA 2020 guidelines for transparency in the selection process. From an initial 326 records, 20 studies that met the inclusion criteria were selected for this review. The results show a 36-percentage-point urban-rural gap in meaningful connectivity in the region; in Ecuador, only 20% of the rural population has access to effective broadband internet service, while 61% of national connections are concentrated in the provinces of Guayas and Pichincha. A regulatory paradox is identified: the Organic Law on Transparency and Access to Public Information (LOTAIP) requires digital transparency in territories lacking the infrastructure to support it. An interdisciplinary framework is proposed that articulates technical telecommunications parameters with dimensions of institutional communication as a tool to guide public policies for effective digital inclusion.

Keywords: digital divide, institutional communication, telecommunications, transparency, citizen participation, e-government, rural areas

1. Introduction

Digital transformation has transformed the interactions between states and citizens, and e-government is a key tool for transparency, accountability and civic engagement (United Nations, 2024). But this development was not even. In Latin America and the Caribbean, a structural digital divide exists, and the exercise of these rights is hampered in these regions. Digital transformation has reinvented the way states connect with citizens, making e-government an essential mechanism for transparency, accountability, and civic engagement (United Nations, 2024). However, this progress was not uniform. In Latin America and the Caribbean, a structural digital divide persists, hindering the effective exercise of these rights in these regions. According to the Inter-American Development Bank's Broadband Development Index (IDBA), the region lags considerably behind the countries of the Organisation for Economic Co-operation and Development (OECD) in terms of telecommunications infrastructure, online services and digital human capital (García Zaballos et al., 2022). This asymmetry intensifies in rural areas: the Inter-American Institute for Cooperation on Agriculture (IICA) reported that, in 2022, the significant connectivity gap between urban and rural regions, 79 and 43.4%, respectively, reached 36 %, leaving approximately 72 million inhabitants of the region without adequate access to digital services (Ziegler et al., 2022).

Ecuador addresses this issue andalthough the country has made significant progress in connectivity, reaching 15.2 million internet users and a national penetration rate of 80.3% by the end of 2024 (Ministry of Telecommunications [MINTEL], 2025a), it is important to note that the distribution of this infrastructure is highly uneven. Sixty-one percent of the country's fixed connection points are concentrated in the provinces of Guayas and Pichincha, and broadband Internet access in rural and isolated areas does not exceed 20% (International Trade Administration [ITA], 2025). A recent study (conducted

by) on e-governance and government e-governance in Ecuador confirms that only 31.3% of the rural population has internet access, compared to 70.7% of the urban population, and that 35% of all citizens have difficulty accessing digital services provided by the government, especially in rural areas (Villao Rodríguez et al., 2025). Analysis of the evidence on the development of Ecuadorian e-government during 2018–2022 reveals that, despite an increase in the E-Government Development Index (EGDI) from? to 0.7015, significant gaps in technological infrastructure and access remain and continue to hinder its widespread adoption (Novillo-Orozco et al., 2024; Visión Empresarial, 2024).

This scenario preconditions what we call a normative paradox in this article. Articles 16 and 18 of the Constitution of Ecuador (2008) guarantee the right to access information and information and communication technologies. The Organic Law on Transparency and Access to Public Information (LOTAIP)[1], requires all public entities to publish information monthly on websites and the National Transparency Portal (Ecuadorian Ombudsman's Office, 2024). Likewise, the Public Policy for Digital Transformation 2025–2030 defines digital citizen participation as a strategic axis (MINTEL, 2025b). However, these obligations assume a telecommunications infrastructure that does not exist in most rural areas of the country. Encarnación et al. (2021) warned that social inequalities precondition the implementation of access to informational advertising, especially in rural areas, where in most cases, there is no internet service, which requires the integration of alternative mechanisms for civic participation. Moreira and Hidalgo (2020) point out that the Decentralized Autonomous Governments (GADs)[2] have not yet reached the levels of e-government adoption observed in the central government, a situation that is especially critical considering that rural parish GADs constitute the government instance closest to the communities and, in many cases, the main channel of interaction between citizens and the State.

The alternative communication channels that are available (community radio, public noticeboards, local assemblies, printed newsletters and face-to-face town hall meetings) can fill in for the lack of internet access, but not to the same extent as digital platforms in terms of immediacy, interactivity, scalability, traceability and continuous accessibility. As a result, while rural people are able to access public information, they still have limited opportunities for continued engagement, online monitoring of accountability, access to documents and real-time engagement with government institutions. The challenge is not only access to information, but also the differential quality and extent of democratic participation that each communication channel can provide.

The literature review shows that this problematic area has been addressed in three disciplinary fields that have developed in parallel and in disjointed ways. On the one hand, research studies on telecommunications infrastructure focus on technical parameters such as coverage, fiber-optic networks, and the deployment of mobile Internet with 4G/5G technologies, but without connecting them to specific communication processes (García Zaballos et al., 2022; Katz and Callorda, 2020). However, studies on e-government and transparency consider digital platforms and regulatory compliance but do not delve into their parameters (Encarnación et al., 2021; Novillo-Orozco et al., 2024; Cellan Palacios et al., 2024). Finally, studies of the digital divide capture the asymmetries of access between urban and rural areas, but they are more focused on the education sector (Oyarce Mariñas et al., 2022; Martínez Molina, 2025), rather than on the implications for communicative institutionalization and local governance. The inclusion and use of digital tools to guarantee citizen participation remains a persistent challenge, even though countries in the region are committed to the digital government (Economic Commission for Latin America and the Caribbean, 2022).

This, in turn, leads to the identification of a gap in the scientific production of Latin American academics: there is no interdisciplinary approach to the issue that systematically combines the analysis of obstacles to infrastructural development with policies for communicative institutionalization aimed at fostering openness and citizen involvement in rural areas. This article aims to examine these barriers through a narrative review with a systematic search and propose an interdisciplinary analytical framework that defines the technical and communicative dimensions. To this end, three specific objectives are set: to define the state of rural telecommunications infrastructure and its internet access service and identify its critical parameters; to analyze the mechanisms of institutional communicative action carried out by local governments and how they depend on the infrastructure; and to propose a framework that coordinates transparency and digital inclusion policies in rural Latin America.

1.1 Theoretical Framework

1.1.1 Digital Divide Theory: The Three Levels of Inequality

The theoretical core of this study is supported by the digital divide theory proposed by van Dijk (2020), who considers

[1] LOTAIP is the Spanish acronym for Ley Orgánica de Transparencia y Acceso a la Información Pública (Organic Law on Transparency and Access to Public Information of Ecuador).

[2] GAD is the Spanish acronym for Gobiernos Autónomos Descentralizados, the local government entities established under Ecuadorian legislation.

digital inequality as a multilevel phenomenon that goes beyond the simple availability of infrastructure. The resource-appropriation model has four successive forms of access: motivational, physical or material, ability, and usage. The first-level gap refers to differences in physical and material access to technologies; the second-level gap involves disparities in digital usage habits and abilities; and the third level involves discrepancies in the outcomes of engagement based on the use of digital media. Van Deursen and van Dijk (2019) have shown that the first level not only stops at access, being binary in nature, but also encompasses material inequalities that are substantial even in highly developed countries such as the Netherlands.

The systematic review by Lythreatis et al. (2022) corroborates the idea that research on the digital divide has focused on the second level of research but has not adequately incorporated the determinants of infrastructure with the findings on social participation. The factors influencing the digital divide can be grouped into nine categories, one of which is infrastructure, which is a necessary but not sufficient condition. In a city-level study, Reddick et al. (2024) empirically demonstrated that the digital divide persists at all three levels and that geographic location, income, and educational levels are significant predictors of digital inequality. Applying this theory to the context of this study, the limitations of telecommunications infrastructure (first level) can be operationalized through van Dijk's theory, such that the capacity of rural communities to access public information and participate in digital governance processes (third level) is limited.

1.1.2 E-government, Digital Transparency, and Citizen Participation

E-government can be described as the application of information and communication technologies by government institutions to improve state services, increase transparency, and enhance citizen participation (United Nations, 2024). The digital government models analyzed by Hujran et al. (2024) propose a progressive process that begins with the availability of basic information and continues until full citizen involvement and value creation by the people. In the more advanced stages, these models overemphasize transparency, accountability, and two-way interaction between the government and citizens. However, Pirannejad and Ingrams (2023) cautioned that most of these models focus on technological capabilities rather than democratic governance and neglect the actual circumstances of public access.

E-participation, understood as the use of digital platforms to engage urban populations in public decision-making processes, is a key indicator of the maturity of digital democratization (Adnan et al., 2024). However, Bisogno et al. (2022) demonstrated that digital transparency and e-participation are predetermined by structural factors related to the technological infrastructure. In Latin America, Encarnación et al. (2021) indicated that e-government represents an ideal means of citizen participation, provided it has the necessary technological and human resources, which are lacking in large areas of rural Ecuador. Moreira and Hidalgo (2020) explain the adoption gap between the central government and decentralized local governments, which is a critical factor in rural governance.

1.1.3 Institutional Communication in Low-Connectivity Environments

In the context of this research, institutional communication is understood as the articulated set of strategies, channels, and practices through which public organizations manage and direct the flow of information to their various audiences, with the purpose of strengthening transparency, institutional legitimacy, and citizen participation. According to the LOTAIP, the process of distributing public information must be carried out through web portals, which directly connect institutional communication with the accessibility of digital infrastructure (Cellán Palacios et al., 2024). This legal dependence on digital channels generates structural tension in regions lacking telecommunications infrastructure and transforms legal transparency into asymmetric transparency that favors connected urban communities and excludes rural communities.

The analysis is enriched by the notion of meaningful connectivity (Ziegler et al., 20202), which transcends the dichotomy of connection/non-connection, and recognizes that there are layers of access that can make communication more or less effective. Beyond quality, speed and cost, which also shape the digital divide, as García Zaballos and others at IDBA show, the digital divide in Latin America is also about coverage.

1.1.4 Telecommunications Infrastructure as an Enabling Condition

The physical and logical components that all data travels through in digital communications are known as telecommunications infrastructure. The physical infrastructure comprises access and last-mile networks (fiber optics, coaxial cable, wireless networks, satellites, etc.), mobile phone base stations (3G, 4G, and 5G radio base stations), Internet access points, and data transport systems. Katz and Callorda (2020) show that the construction of a digital ecosystem, that is, broadband infrastructure, has effects on economic development and social inclusion. But there are also certain barriers to the deployment of this infrastructure in rural environments: the low population density which reduces the profitability of the project, the difficult terrain which makes installation more expensive, and regulatory policies which do not always favour development in inaccessible areas (García Zaballos et al., 2022).

Fiber optics is the primary physical medium used by internet service providers for fixed connections in Ecuador, reaching 88.3% of the population, although in urban centers, it is unevenly distributed, reaching only 78.45% (ARCOTEL,

2024). Advanced mobile service coverage reaches 78.45% of the population, although in rural parishes, this figure masks significant disparities in service quality, speed, and stability (MINTEL, 2025a). According to van Dijk's model (2020), these parameters and technical realities constitute a major obstacle preventing the rural population from reaching the next stage of digitalization, such as participation in e-government systems and institutional opennessThe four theoretical perspectives incorporated in this study were selected because each addresses a different dimension of the same problem and compensates for the limitations of the others. Digital Divide Theory explains inequalities in access to, use of, and outcomes related to digital technologies, but offers a limited view of government communication processes.

E-government theory focuses on the use of digital technologies to facilitate transparency and participation in public institutions, but it is not always recognized that there is sufficient technological infrastructure. Institutional communication theory has helped in understanding how public organizations communicate with citizens but, in general, does not take into account infrastructure restrictions. Finally, telecommunications infrastructure studies offer technical explanations of connectivity, coverage, bandwidth and quality of service, but they seldom consider their implications for governance and communication.

This study combines these views in order to create an interdisciplinary approach that can account for the way infrastructure restrictions produce communication restrictions that in turn have consequences for transparency and citizens' participation. The theoretical expression fills a void in literature, not considering both the technical and communicative aspects.

2. Method

2.1 Research Design

The design of a narrative review with a systematic search was selected, as the methodological guidelines of Ferrari (2015) and Sukhera (2022) indicate a rigorous narrative review and the PRISMA 2020 protocol (Page et al., 2021) was used to ensure transparency in the identification, selection and inclusion of studies. This design is not a traditional narrative or purely systematic review, is associated with a risk of bias assessment, and involves a quantitative meta-analysis. When it comes to the intersection of telecommunications and institutional communication, narrative reviews with systematic searches are suitable, as they draw evidence from various disciplines and through different approaches (Greenhalgh et al., 2018).

2.2 Search Strategy

The search was conducted between January and March 2026 in five databases: Scopus, Web of Science (WoS), SciELO, Redalyc, and Google Scholar. Search strings in Spanish and English were used, combining three thematic areas with the Boolean operators AND and OR:

a) Digital division OR telecommunications infrastructure OR rural connectivity OR broadband

b) Institutional communication OR transparency OR citizen participation OR e-government OR accountability; and

c) Rural OR Ecuador OR Latin America. Institutional documents from the Telecommunications Regulation and Control Agency (ARCOTEL[3]), Ministry of Telecommunications (MINTEL[4]), LA PALCA, IICA, Inter-American Development Bank (IDB), and United Nations were also consulted.

2.3 Inclusion and Exclusion Criteria

Table 1 presents the criteria applied for selecting the studies. The criteria were defined as a *priori* and applied independently by both authors, with any discrepancies resolved by consensus. The inclusion and exclusion criteria were established a priori and applied independently by both authors. During the selection process, discrepancies arose primarily regarding studies that addressed the digital divide from educational perspectives and were only indirectly related to governance, transparency, institutional communication, or telecommunications infrastructure. In these cases, the authors jointly re-evaluated the full texts and analyzed their relevance to the review objectives. A study was included only when both reviewers agreed that it made a substantial contribution to understanding the relationship between the digital divide and institutional communication or governance processes. This consensus-based procedure strengthened the consistency and reliability of the study selection process.

[3] ARCOTEL is the Spanish acronym for Agencia de Regulación y Control de las Telecomunicaciones, Ecuador's telecommunications regulatory authority.

[4] MINTEL is the Spanish acronym for Ministerio de Telecomunicaciones y de la Sociedad de la Información, Ecuador's Ministry of Telecommunications and the Information Society.

Table 1. Inclusion and exclusion criteria

Criterion	Inclusion	Exclusion
Temporality	Publications 2020–2025	Prior to 2020 (except seminal theoretical texts)
Language	Spanish and English	Other languages
Scope	Latin America (with emphasis on Ecuador) or international studies with regional applicability	Exclusive to other regions without comparability
Subject	Digital divide + governance/transparency/institutional communication/telecommunications infrastructure	Digital divide exclusively educational with no link to governance or communication
Source type	Indexed articles, academic books, reports from international organizations, public policy documents	Press releases, blogs, unpublished papers, undergraduate theses
Access	Full text available	Summary only available

Source: Own elaboration.

2.4 Selection Process (PRISMA Flowchart)

The selection process was conducted according to the PRISMA 2020 flowchart (Page et al., 2021). The preliminary search yielded 326 records. After removing 78 duplicates, 248 titles and abstracts were examined; 176 were eliminated for not meeting the thematic or geographical criteria. The remaining 72 texts were read in their entirety, and 52 were eliminated because they did not specifically address the connection between telecommunications infrastructure and institutional communication, transparency, or citizen participation. The final synthesis included 20 documents (Table 2).

Table 2. PRISMA flowchart of the selection process

Identification: Records in databases (n = 326)	
After removing duplicates (n = 248)	Excluded: 78 duplicates
Screening by title and abstract (n = 72)	Excluded: 176 by criteria
Full text reading (n = 20)	Excluded: 52 without articulation
STUDIES INCLUDED IN THE SYNTHESIS (n = 20)	

Source: Own elaboration, adapted from PRISMA 2020 (Page et al., 2021).

All the documentary sources used in this study come from publicly accessible academic databases (Scopus, Web of Science, Google Scholar, institutional repositories) and from official documents available on the transparency portals of the entities studied.

2.5 Data Analysis

A three-phase thematic analysis was used.

a) Open coding of key findings from each document.

b) Axial classification, grouping the codes into technical dimensions (telecommunications infrastructure) and communicational dimensions (transparency, participation, and institutional communication).

c) Theoretical integration through the construction of an interdisciplinary articulation matrix that connects technical parameters with specific communicative functions. This process allowed for the triangulation of heterogeneous sources and the creation of an original analytical framework (Sukhera, 2022).

3. Results

3.1 Characterization of the Included Studies

A summary of the 20 selected studies is presented in Table 3. Of these, 13 were scientific articles in indexed journals, three were systematic reviews or cartographic studies, two were institutional reports from international organizations, one was an academic book, and one was a methodological article. Geographically, seven studies were based in Ecuador, three in Latin America, three in Europe/the Netherlands, and seven had an international/multinational scope. The period covered is between 2020 and 2025, with a focus on 2022–2024.

Table 3. Summary of the studies included in the review (n = 20)

Author(s) and year	Country/Region	Type	Finding / Key Contribution
van Dijk (2020)	Netherlands	Book	Three-level model of the digital divide: physical access, skills, and participation outcomes
van Deursen y van Dijk (2019)	Netherlands	Empirical article	The first level of the digital divide shifts from inequalities of physical access to inequalities of material access
Lythreatis et al. (2022)	United Kingdom / UAE	Systematic review	It identifies 9 categories of factors that affect the digital divide; infrastructure is a key determinant
Reddick et al. (2024)	USA	Empirical article	The digital divide persists at all three levels; geographic location is a significant predictor
García Zaballos et al. (2022)	Latin America (IDB)	Institutional report	IDBA Index: The gap in Latin America and the Caribbean is in coverage, quality, speed, and cost; Ecuador in an intermediate position
Ziegler et al. (2020)	Latin America (IICA)	Institutional report	Meaningful rural connectivity: 43.4% vs. 79% urban; 72 million without access; gap of 36 points
Katz y Callorda (2020)	Global / Latin America	Article	The development of broadband and ICT has significantly impacted economic growth and social inclusion.
Encarnación et al. (2021)	Ecuador	Article	E-government requires infrastructure; in rural areas without the Internet, alternative mechanisms are needed.
Moreira e Hidalgo (2020)	Ecuador	Article	Local governments show lower levels of e-government adoption than central governments.
Novillo-Orozco et al. (2024)	Ecuador	Article	Ecuador's EGDI rose to 0.7015 but infrastructure and digital access gaps persist
Visión Empresarial (2024)	Ecuador	Artículo	Progress in simplifying electronic procedures, but the rural gap persists in e-government
Villao Rodríguez et al. (2025)	Ecuador	Article	65% perceive improvements in digital services; 35% face difficulties concentrated in rural areas
Cellán Palacios et al. (2024)	Ecuador	Narrative review	Institutional websites are functionally adequate, but lack updates and accessibility.
Adnan et al. (2024)	Malaysia / Global	Systematic review	E-participation is fragmented and under-theorized; infrastructure is a key obstacle
Bisogno et al. (2022)	Italy / Spain	Empirical article	E-government and e-participation initiatives improve budget transparency
Pirannejad e Ingrams (2023)	Iran / Netherlands	Article	Open government maturity models prioritize technological capabilities over democratic governance
Hujran et al. (2024)	Jordan / UAE	Systematic mapping	Citizenship-centrism and participation are the most advanced stages of e-government maturity
Oyarce Mariñas et al. (2022)	Perú	Article	Rural digital divide exacerbated by the pandemic; infrastructure and training are the main barriers
Martínez Molina (2025)	Venezuela / ALC	Article	Only 40% of rural Ecuadorian teachers trained in ICT; urban bias in digital resources
Sukhera (2022)	Canadá	Methodological article	Narrative reviews are flexible, rigorous, and practical for emerging fields

Source: Own elaboration.

3.2 State of Rural Telecommunications Infrastructure

A review of the existingliterature indicates an pertinent and multidimensional infrastructure gap in Latin America. Meaningful rural connectivity is at 43.4% in the region, compared to 79% in urban areas, with a difference of two percentage points between 2020 and 2022 (Ziegler et al., 2020). According to the IDB Index, Ecuador is in the middle of

the region, where mobile coverage has improved, but the quality and speed of fixed broadband lag behind (García Zaballos et al., 2022). These deficiencies are not only technical issues; Katz and Callorda (2020) revealed their direct effects on social inclusion and economic growth in the affected territories.

In particular, Ecuadorian data (Table 3) show a marked difference: 4G coverage is available to 78.45% of the population, and only 20% of rural areas have access to effective broadband (ITA, 2025; MINTEL, 2025a). Fiber optics account for 88.3% of the country's total fixed connections, but the country is almost entirely urbanized (ARCOTEL, 2024). The level of geographic concentration is very high: 61% of connections are in Guayas and Pichincha, while the remaining 22 provinces account for 39% of connections. Only 575 of the 733 rural parishes (78.45%) have mobile service, and the growth rate was only 15 new parishes in 2024 (MINTEL, 2025a).

Table 4. Telecommunications Infrastructure Indicators in Ecuador (2024)

Indicator	National/Urban	Rural
Internet penetration	80,3%	~31,3%
Broadband adoption	>70%	~20%
4G population coverage	78,45%	Variable (without disaggregated data)
Fiber optic connections	88.3% of the total fixed	Marginal
Geographic concentration	61% in Guayas and Pichincha	39% in 22 provinces
Rural parishes with SMA	—	575/733 (78,45%)
New parishes connected (2024)	—	15 parishes

No. SMA = Advanced Mobile Service. Sources: ARCOTEL (2024), MINTEL (2025a), ITA (2025), Villao Rodríguez et al. (2025).

3.3 Institutional Communication Mechanisms and Digital Dependence

The review revealed that the Organic Law on Transparency and Access to Public Information (LOTAIP) and its provisions establish the mandatory monthly publication of institutional information on the National Transparency Portal and the websites of each entity (Ecuadorian Ombudsman's Office, 2024). This compliance requirement implies a strong dependence on digital infrastructure to meet the transparency requirements. According to a report by Cellán Palacios et al. (2024), the websites of Ecuadorian institutions are functionally aligned with LOTAIP requirements, but they also lack significant updates and effective access to the information published about them, as well as their quality.

Moreira and Hidalgo (2020) show that local governments (GADs) have much lower e-government adoption than the central government, indicating an institutional gap that intersects with an infrastructure gap. According to Novillo-Orozco et al. (2024), although public administration has made regulatory progress in the last five years (2018-2022), the digitization of public administration is still uneven across different levels of government. According to Villao Rodríguez et al. (2025), although 65% of citizens believe that digital services have improved, 35% of the population faces challenges, which are concentrated in rural regions.

In regions where there is no Internet connection, other instruments to reach citizens and inform them about government information should be concentrated, as Encarnación et al. (2021) discovered. But they found no systematic evidence that rural parish governments are implementing hybrid (face-to-face-digital) institutional communication strategies specifically designed to low connectivity settings. The gap is an important finding which indicates the lack of social policy and academic literature.

Encarnación et al. (2021) found that in areas without Internet access, other tools for engaging citizens and accessing government information should be centralized. However, they determined that there is no systematic evidence that rural parish governments are adopting hybrid (face-to-face-digital) institutional communication strategies specifically adapted to low connectivity environments. This gap is an important finding that highlights a deficiency in social policy and academic literature.

3.4 Proposed Interdisciplinary Analysis Framework

Based on the theoretical synthesis of the results, an analytical framework was developed that connects telecommunications infrastructure barriers to institutional communication functions. This connection is shown in Table 4, which indicates the technical parameters influencing each communication function, the impact on transparency, and the degree of the digital divide in the model proposed by van Dijk (2020). This framework allows us to move beyond the generic approaches of the existing literature to show that it is not enough to simply refer to the lack of Internet access as a barrier; rather, it is necessary to determine which specific technical parameter restricts which particular communication function.

Table 5. Framework for articulation: telecommunications infrastructure and institutional communication

Technical Parameter	Affected communication function	Consequence for transparency	Nivel de brecha (van Dijk)
Mobile Network Coverage	Access to transparency portals (LOTAIP)	Inability to access public information	Level 1: Physical access
Available bandwidth	Download institutional documents	Excessive waiting times; abandonment of consultation	Level 1: material access
Quality of service (latency, stability)	Participation in virtual accountability hearings	Exclusion from accountability mechanisms	Level 1–2: Access and Use
Technology type (2G/3G/4G)	Access to institutional multimedia content	Communication limited to text; loss of informational richness	Level 1: Physical access
Service cost	Frequency of access to public information	Self-exclusion due to economic priorities	Level 1: material access
Base station density	Territorial coverage of digital institutional communication	Zones of institutional information silence	Level 1: Physical access

Source: Prepared by the author based on van Dijk (2020), ARCOTEL (2024), MINTEL (2025a), Ziegler et al. (2022).

4. Discussion

Again, in Ecuador, as in Latin America, a systematic disconnection is confirmed in the policies and actions of telecommunications infrastructure, transparency and participation of the citizens. This disconnect can be seen in three dimensions, at least, as discussed below.

First, it is claimed that the first level digital divide, as described by van Dijk (2020), is not resolved in rural areas, thus undermining the idea that progress should be based on national penetration rates. In the rural area, there is no efficient access to the internet in Ecuador, with a penetration rate of only 20.31% percent (ITA, 2025; Villao Rodriguez et al., 2025), despite covering 80.3% percent of the country's territory (MINTEL, 2025a). This is consistent with the results of Reddick et al. (2024) which showed that inequalities were found at all three levels, even in developed countries, even in urban areas, and that geographic location was an important predictor of inequalities. The Ecuadorian rural environment is more visible in the first level barriers relative to the geographical concentration of the infrastructure and to the geographical complexity of the territory (highlands, Amazon rainforest and islands).

Furthermore, the findings highlight what we call the normative paradox of digital transparency: the LOTAIP and e-government systems require the use of digital media for institutional communication in territories where telecommunications infrastructure cannot facilitate such flows. This correlates with the warnings issued by Encarnación et al. (2021) regarding the need for alternative participation mechanisms and Bisogno et al. (2022), who demonstrated that technological infrastructure preconditions e-participation and budget transparency. Adnan et al. (2024) report that e-participation is a fragmented area in which infrastructure is a major obstacle in developing countries. There is no evidence of hybrid strategies in local governments at the rural parish level, indicating a structural failure that cannot be described as institutional negligence, but rather as a technical impossibility.

Furthermore, the proposed analytical framework (Table 4) is an original contribution that explicitly links telecommunications technical parameters to specific communication functions. Pirannejad and Ingrams (2023) and Hujran et al. (2024) showed that digital government maturity models prioritize technological capabilities without providing granularity on which specific technical parameters affect each communication function. Our framework overcomes this limitation by offering a tool that allows telecommunications engineers to understand which technical thresholds are necessary to support transparency functions; institutional communicators to design realistic strategies tailored to the capabilities of the territory; and public policymakers to prioritize infrastructure investments based on communication criteria.

4.1 Implications for Public Policy

The results suggest that the Public Policy for Digital Transformation 2025–2030 (MINTEL, 2025b) should incorporate institutional communication indicators as criteria for prioritizing rural infrastructure investments. The Universal Service Plan 2022–2025, which is progressing at a rate of 15 rural parishes per year, is insufficient to close the gap in the short term, given that there are over 1,140 rural parishes in the country. It is recommended that the LOTAIP and its regulations explicitly include alternative mechanisms for transparency and participation in areas with low connectivity, such as hybrid (in-person-digital) models that combine physical notice boards, community radio stations, in-person assemblies, and public access points with digital tools when available.

4.2 Limitations of the Study

The following limitations are recognised: the narrative review with systematic search, while following PRISMA principles and showing transparency in the process, doesn't have the comprehensiveness of a systematic review with registered protocol and meta-analysis. Unlike the narrative review design, included studies were not subjected to a formal

risk of bias assessment, though this did reduce causal inferences. The small number of papers produced, which incorporate both disciplines, in the Latin American rural context led to the inclusion of a limited number of studies (n=20) and at the same time represent the methodological limitation that justifies this research.

This systematic review of the search narrative concluded with three main conclusions: One of the main obstacles directly affecting the capacity of local state institutions to communicate with the population and satisfy the transparency requirements is the digital divide between rural Ecuador and Latin America (van Dijk, 2020). Despite the fact that the country has high internet penetration rate (80%+), only one-third of the population has access to the internet in rural areas, with the infrastructure being very localized in the provinces of Guayas and Pichincha.

There is a regulatory paradox regarding digital transparency: the Organic Law on Transparency and Access to Public Information and the e-government framework presuppose digital means of institutional communication in territories where telecommunications infrastructure is inadequate, without offering alternative communication mechanisms in situations of low or no connectivity. Therefore, local governments at the rural parish level experience a structural failure that cannot be addressed through regulations alone but only through investment in infrastructure and the development of hybrid communication strategies adapted to the local context.

Finally, the proposed interdisciplinary analytical framework is a novel tool that integrates technical telecommunications parameters (coverage, bandwidth, quality of service, technology type, cost, and radio base station density) with the dimensions of institutional communication (access to portals, document downloads, participation in virtual hearings, and access to multimedia content). This provides an instrument for guiding digitally inclusive public policies regarding transparency. Future studies should empirically validate this framework in specific local governments at the rural parish-level decentralized autonomous government level and investigate hybrid forms of institutional communication to implement communication for development strategies that are adapted to the varying degrees of territorial connectivity present in Ecuador and Latin America.

4.3 Recommendations

The Public Policy for Digital Transformation 2025-2030 should incorporate institutional communication indicators as criteria for prioritizing infrastructure investments in rural areas. Likewise, the LOTAIP framework should explicitly recognize hybrid transparency mechanisms for territories with limited connectivity.

Furthermore, rural parish governments should adopt hybrid communication strategies that combine digital tools such as community radio, public assemblies, physical notice boards, and local information centers to ensure inclusive transparency practices.

For future research, the interdisciplinary framework proposed in this article should be empirically validated, its applicability evaluated in different territorial contexts, and the effectiveness of hybrid communication models in low-connectivity environments examined.

4.4 Conclusions

This study demonstrates that the digital divide remains a structural barrier to institutional communication, transparency, and citizen participation in rural areas of Ecuador and Latin America. Despite progress in national connectivity indicators, significant territorial inequalities persist in access to broadband, service quality, and infrastructure deployment.

The findings reveal a regulatory paradox: transparency and e-government regulations increasingly depend on digital communication channels, while large rural areas still lack the necessary infrastructure to access them effectively. Consequently, legal guarantees of transparency cannot be translated into practical accessibility for rural populations.

The main contribution of this article is the development of an interdisciplinary analytical framework that integrates telecommunications infrastructure variables with institutional communication functions. This framework provides a novel perspective for understanding how technical limitations influence governance, transparency, and citizen participation outcomes.

Addressing these challenges requires not only expanding telecommunications infrastructure but also developing hybrid communication models adapted to the realities of low- and no-connectivity environments. This approach would contribute to more inclusive digital transformation policies throughout Ecuador and Latin America.

Acknowledgments

The authors are grateful to colleagues in the field who kindly reviewed earlier versions of this manuscript and provided valuable comments and observations that substantially improved its clarity and rigor.

Author contributions

Todos los autores contribuyeron por igual a la concepción, el diseño, el análisis y la redacción de este estudio. Todos los autores leyeron y aprobaron el manuscrito final.

Funding

This research was fully funded by Universidad Politécnica Estatal del Carchi (UPEC), Ecuador. The authors gratefully acknowledge the institution's financial support for the development of this study.

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Informed consent

Obtained.

Ethics approval

The Publication Ethics Committee of the Redfame Publishing.

The journal's policies adhere to the Core Practices established by the Committee on Publication Ethics (COPE).

Provenance and peer review

Not commissioned; externally double-blind peer reviewed.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Data sharing statement

No additional data are available.

Open access

This is an open-access article distributed under the terms and conditions of the Creative Commons Attribution license (http://creativecommons.org/licenses/by/4.0/).

Copyrights

Copyright for this article is retained by the author(s), with first publication rights granted to the journal.

References

Benlahcene, A., Awang, H., Mansor, N. S., Ghazali, O., Mohd Nadzir, M., Mat Yamin, F., & Tudu Shehu Malami, S. (2024). Electronic citizen participation through e-government services: A systematic literature review. *Cogent Social Sciences, 10*(1). https://doi.org/10.1080/23311886.2024.2415526

Bisogno, M., Cuadrado-Ballesteros, B., & Santis, S. (2022). Do e-government initiatives and e-participation affect the level of budget transparency? *International Public Management Journal, 25*(3), 365-391. https://doi.org/10.1080/10967494.2022.2042437

Business Vision. (2024). Analysis of the development of e-government in Ecuador 2018-2022. *Business Vision,* (14), 108-128. https://doi.org/10.32645/13906852.1324

Cellán Palacios, J. J., Santillán Andrade, J. R., Cruz Piza, I. A., & Villacrés Duche, O. F. (2024). The right to information in Ecuador in light of new communication paradigms: A narrative review. Bibliotecas. *Anales de Investigación, 20*(1), 130-144. Retrieved from https://revistasbnjm.sld.cu/index.php/BAI/article/view/801

Digitalization, Youth Employment and Digital Skills. (2022). Rural connectivity in Latin America and the Caribbean. San José, Costa Rica: Inter-American Institute for Cooperation on Agriculture. Retrieved from https://repositorio.iica.int/items/cdf53134-da03-40c8-a6cd-5908a58a9d05

Economic Commission for Latin America and the Caribbean. (2022). *Digital government and digital transformation in Latin America and the Caribbean*. Santiago, Chile: United Nations Economic Commission for Latin America and the Caribbean (ECLAC). Retrieved from https://www.cepal.org/

Ecuadorian Ombudsman's Office. (2024). Resolution No. 015-DPE-CGAJ-2024: Instructions for the application of the LOTAIP. Quito, Ecuador: Ecuadorian Ombudsman's Office. Retrieved from https://www.dpe.gob.ec/transparencia-lotaip/

Encarnación, S., Díaz, D., & Armijos, M. (2021). Reflections on e-government and citizen participation in Ecuador. *Euro-Latin American Journal of Administrative Law, 8*(1), 77-98. https://doi.org/10.14409/redoeda.v8i1.9562

Ferrari, R. (2015). Writing literary reviews in narrative style. *Medical Writing, 24*(4), 230-235. https://doi.org/10.1179/2047480615Z.000000000329

García Zaballos, A., Iglesias Rodriguez, E., & Puig Gabarró, P. (2022). Annual report of the Broadband Development Index: Digital divide in Latin America and the Caribbean: IDBA 2022. Washington, DC: Inter-American Development Bank. https://doi.org/10.18235/0004379

Greenhalgh, T., Thorne, S., & Malterud, K. (2018). Is it time to challenge the spurious hierarchy of systematic reviews over narratives? *European Journal of Clinical Investigation, 48*(6), e12931. https://doi.org/10.1111/eci.12931

Hujran, O., Al-Debei, M. M., Al-Adwan, A. S., & Alarabiat, A. (2024). Exploring the e-government maturity model landscape: Perspectives from a systematic mapping study and comparative analysis. *Digital Library, 5*(2), 1-26. https://doi.org/10.1145/3656586

International Trade Administration. (2025). Ecuador – Digital economy. Washington, DC: U.S. Department of Commerce. Retrieved from https://www.trade.gov/country-commercial-guides/ecuador-digital-economy

Katz, R., & Callorda, F. (2019). The economic contribution of broadband, digitization and ICT regulation: Econometric modelling for the Americas. Geneva, Switzerland: International Telecommunication Union.

Lythreatis, S., Singh, S. K., & El-Kassar, A.-N. (2022). The digital divide: A review and future research agenda. *Technological Forecasting and Social Change, 175*, 121359. https://doi.org/10.1016/j.techfore.2021.121359

Martínez Molina, O. A. (2025). Digital rural education: Overcoming the gap in Latin America. *Scientific Journal, 10*(Special Issue 6), 10-21. https://doi.org/10.29394/Scientific.issn.2542-2987.2025.10.E6.0.10-21

Ministry of Telecommunications and the Information Society. (2025a). Accountability report for the 2024 period. Quito, Ecuador: Ministry of Telecommunications and the Information Society. Retrieved from https://www.telecomunicaciones.gob.ec/

Ministry of Telecommunications and the Information Society. (2025b). Public policy for the digital transformation of Ecuador 2025-2030. Quito, Ecuador: Ministry of Telecommunications and the Information Society. Retrieved from https://www.gobiernoelectronico.gob.ec/

Miranda Muñoz, D. J. M., Tingo Macías, M. A., Zamora Mendoza, C. A., & Zamora Mayorga, D. J. (2025). Impact of e-government on the efficiency and transparency of public management in Ecuador. *Veritas Journal, 6*(1), 1-18. https://doi.org/10.61616/rvdc.v6i1.426

Moreira Mera, M. M., & Hidalgo Ávila, A. A. (2020). Electronic government in Ecuador. Polo del Conocimiento, 5(8), 944-961. Retrieved from https://polodelconocimiento.com/ojs/index.php/es/article/view/1635/html

Novillo-Orozco, V. X., Naranjo-Rodas, P. P., & Barreno-Yambay, M. F. (2024). From the trash can to the cloud: An analysis of the development of e-government in Ecuador from 2018 to 2022. *MQRInvestigar, 8*(1), 5001-5013. https://doi.org/10.56048/MQR20225.8.1.2024.5001-5013

Oyarce Mariñas, V. A., Silva Orosco, L., & Abanto Yóplac, S. A. (2022). Digital divide and virtual education in rural educational institutions. *LATAM Latin American Journal of Social Sciences and Humanities, 3*(2), 534-546. https://doi.org/10.56712/latam.v3i2.116

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., ... & Moher, D. (2021). The PRISMA statement 2020: An updated guide for submitting systematic reviews. *BMJ, 372*, n71. https://doi.org/10.1136/bmj.n71

Pirannejad, A., & Ingrams, A. (2023). Open government maturity models: A global comparison. *Social Science Computer Review, 41*(4), 1129-1156. https://doi.org/10.1177/08944393211063107

Reddick, C. G., Enriquez, R., Harris, R. J., & Flores, J. (2024). Understanding levels of digital inequality within the city. *Cities, 148*, 104852. https://doi.org/10.1016/j.cities.2024.104844

Sukhera, J. (2022). Narrative reviews: Flexible, rigorous, and practical. *Journal of Graduate Medical Education, 14*(4), 414-417. https://doi.org/10.4300/JGME-D-22-00480.1

Telecommunications Regulation and Control Agency. (2024). Statistical bulletin year-end 2024 (Bulletin No. 2025-01). Quito, Ecuador: Telecommunications Regulation and Control Agency. Retrieved from https://www.arcotel.gob.ec/

United Nations. (2024). United Nations e-government survey 2024. New York, NY: Department of Economic and Social Affairs. Retrieved from https://publicadministration.un.org/egovkb/en-us/Reports/UN-E-Government-Survey-2024

van Deursen, A., & van Dijk, J. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society, 21*(2), 354-375. https://doi.org/10.1177/1461444818797082

van Dijk, J. A. G. M. (2020). The digital divide. Cambridge, England: Polity Press. Retrieved from https://www.researchgate.net/publication/336775088_Jan_van_Dijk_20192020_The_Digital_Divide_Polity_Press

Ziegler, S., Segura, J. A., Bosio, M., & Camacho, K. (2020). Rural Connectivity in Latin America and the Caribbean—A Bridge to Sustainable Development During a Pandemic. Sna Jose: Inter-American Institute for Cooperation on Agriculture (IICA). Available online: https://repositorio. iica. int/handle/11324/12896 (accessed on 24 March 2021).